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NOTES ON THE GENUS TOWNSENDIA IN WESTERN NORTH AMERICA

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While identifying the Compositae collected by Miss Annie M. Alexander and Miss Louise Kellogg in the Sweetwater Mountains of California and Nevada during the summer of 1945, I encountered a number of specimens of *Townsendia.* An investigation of herbarium material of the genus was undertaken, and since field studies seem out of the question at present, I am recording here some of my results.

In the revision of the genus by Larsen (1927), nineteen species are recognized for the genus. Larsen lists only two species, *Townsendia scapigera* and *T. Watsoni,* as occurring in the states of California and Nevada. The last few years have witnessed increasing collecting activity in the Great Basin area and additional material has been obtained so that seven species are now known to occur in these states.

Since the publication of Larsen's paper, two new species have been described, *T. minima* Eastwood (1936) from Utah and *T. diversa* Osterhout (1928) from Colorado. The description of another new species in the present paper brings the total number of species recognized to twenty-two, some of which doubtfully deserve specific rank.

All of the specimens cited are deposited in the Herbarium of the University of California, Berkeley, unless otherwise indicated. During the course of this study, material has been examined from the California Academy of Science (CA), the Missouri Botanical Garden (MBG), the Dudley Herbarium of Stanford University, the United States National Herbarium, the Intermountain Herbarium of Utah State Agricultural College (IH), and the Rocky Mountain Herbarium of Wyoming University. I would like to thank the curators of these herbaria for the privilege of examining their specimens.

Townsendia sericea has been collected in both California (Mono County: *Maguire & Holmgren 26109; Duran 1661*) and Nevada (Nye County: *Maguire & Holmgren 25818, 25944*). *Townsendia incana* is known from Nevada from a specimen collected by

Shockley (*103*) in Nye County, and has recently been reported from Lincoln County by Barneby (1947). *Townsendia arizonica* has been collected several times in Clark County, Nevada, chiefly in the Charleston Mountains (*Alexander 774, 780; Alexander & Kellogg 1558, 1568, 1676; Clokey 7772, 7773; Ripley & Barneby 2910*).

Townsendia spathulata is known from high altitudes at three localities in Mono County, California (*Duran 1662, Maguire & Holmgren 26109a, Alexander & Kellogg 4061*). Alexander and Kellogg have noted that the single plant of this species which they collected was growing with *T. scapigera.* The Maguire and Holmgren specimen is only a fragment mounted on a sheet with *T. sericea.*

Townsendia florifer has been collected several times in Nevada: [Elko County: May 10, 1942, *Cantelow s. n.* (CA); *Ripley & Barneby 4613* (CA); *Maguire & Holmgren 2828; Holmgren & Lund 3* (IH). White Pine County: *Ripley & Barneby 3596* (CA)]. *Townsendia Watsonii* was reported from Nevada by Larsen on the basis of a specimen collected in 1891 by A. J. Jones, without definite locality. This entity, however, is scarcely specifically distinct from *T. florifer.*

One of the most interesting species in the genus, *T. scapigera,* was known in California from only one collection at the time of Larsen's revision, and was not known from Nevada at that time. It is now known for several stations in both states. Only one collector is cited for each county. [California. Inyo County: *Alexander & Kellogg 2492, 2993, 3020, 3036.* Mono County: *Alexander & Kellogg 3959, 4053, 4556, 4556A, 4561.* Modoc County: May 1879, *Lemmon s. n.* Nevada. Elko County: *Holmgren 1034, 00245* (IH). Esmeralda County: *Maguire & Holmgren 25640.* Mineral County: *Alexander & Kellogg 4440.* Nye County: *Train 2738.* White Pine County: May 1918, *King s. n.* (CA). Eureka-Lander counties: *Eastwood & Howell 168, 175* (CA)].

Townsendia scapigera is an extremely variable species, and the forms found in Inyo and Mono counties deserve special mention. In Inyo County, dwarf forms occur which have rays 7–11 mm. long, heads 11–13 mm. high, and 12–22 involucral bracts (*Alexander & Kellogg 3036, 3020, 2993*). The plants from the Sweetwater Mountains (*Alexander & Kellogg 4556, 4556A, 4053, 3959*), on the other hand, are large, with rays 14–16 mm. long, heads 15–20 mm. high, and 30–37 involucral bracts. Examination of the pollen of the latter specimens revealed a high percentage of empty grains, as well as the presence of both 3- and 4-pored grains similar to those found in many apomictic species. It would not appear wise to give formal taxonomic recognition to these entities until further studies can be undertaken.

During the summers of 1946 and 1947 I had the privilege of

examining the specimens of *Townsendia* in the herbarium of the Missouri Botanical Garden. Of particular interest were the specimens collected by von Schrenk in Wyoming which Larsen in her revision interpreted as *T. scapigera.* These specimens do not fall within the range of any known species of the genus and accordingly are described as new.

Townsendia anomala sp. nov. Herba perennis ad 4 cm. alta, foliis spathulatis usque 1 cm. longis 3 mm. latis dense strigillosis, capitulis in ramis foliaceis brevi-pedunculatis, involucri bracteis lanceolatis acuminatis, marginibus membranaceis latis, pappis plurisetosis, setis disciflorum ca. 5 mm. longis, ligulis ca. 4 mm. longis, achaeniis 3–4 mm. longis leviter pubescentibus, pilis brevibus crassis, plerumque simplicibus aliquando emarginatis vel brevibidentatis.

Perennial up to 4 cm. in height; leaves spathulate, 1 cm. or less long, 3 mm. or less wide, densely strigillose; heads on leafy branches, short pedunculate; involucre 2–3 seriate, 6–8 mm. wide; bracts of the involucre lanceolate, acuminate with wide membraceous margins; rays about 15, 5–7 mm. long, about 1 mm. wide; pappus plurisetose, the setae of the disk-flowers slightly longer than that of the ray-flowers; achenes 3–4 mm. long, lightly pubescent with short, thick, mostly simple or sometimes emarginate or short-bidentate hairs.

Specimens examined. Wyoming. Park County: dry ridge, Howell Ranch, August 26, 1922, *H. von Schrenk s. n.* (type, herbarium of the Missouri Botanical Garden, no. 901271); Holm Lodge, about 40 miles west of Cody, August 27, 1922, *H. von Schrenk s. n.* (MBG).

The Howell Ranch, on which Holm Lodge is located, is ten miles east of the east entrance of Yellowstone Park at an altitude of approximately 7000 feet.

The new species appears to be more closely related to *T. spathulata* than to *T. scapigera,* and is found in the range of the former species. *Townsendia spathulata* occurs at altitudes of from 8000 to 12000 feet. *Townsendia anomala* is rather readily distinguished from it by the pubescence of the leaves and the much smaller heads which are borne on short leafy branches rather than being sessile. The hairs of the achenes of both species are more or less similar. Larsen describes the hairs of the achenes of *T. spathulata* as bidentate, but as has been pointed out by Hitchcock and Thompson (1945) the hairs may be simple in this species.

A number of problems in the genus *Townsendia* call for extensive field work and experimental studies. The majority of the species recognized at present are rather clearcut over most of their range, but this distinction is frequently blurred at the boundaries. For example, *T. strigosa* is a rather well defined entity throughout the southern part of its range, but in Wyoming this species appears to approach *T. florifer.* Whether hybridization or

some other factor is responsible can only be revealed by future studies.

Townsendia, for the most part, is confined to rather high altitudes in the Rocky Mountains. From my preliminary survey of the genus it is apparent that certain mountain ranges possess distinctive races or species. A critical correlation of the geographical distribution and morphological variation in the genus should reveal the effects of isolation and the origin of new forms or species.

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SOME PARALLELS BETWEEN DESERT AND ALPINE FLORA IN CALIFORNIA

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At first sight it may seem that a desert flora is the opposite of an alpine flora, just as the climatic conditions seem so different. The alpine flora is usually largely influenced by the long cold winters, whereas the desert flora derives its specific character from the hot summers and lack of water.

A comparison will be made between the flora of the central and southern Sierra Nevada (Yosemite and Sequoia National parks) and the Mohave and Colorado deserts of California. In and around these deserts several mountain ranges reach into the alpine zone so that a continuous range of climatic conditions links the two chosen areas; for comparison, however, the extremes will be discussed: montane and alpine conditions at 2000 meters and higher, the desert conditions below 1000 meters.

The alpine climate is one of a very short growing season of about two months duration (July and August) at altitudes of 3000 meters (Clausen, Keck, and Hiesey, 1940) and a little longer at 2500 meters. Due to the relatively small precipitation, snow cover is in most localities not the limiting factor determining the beginning and end of the growing season. Only towards the end of June do the mean minimal daily temperatures reach values near 0° C.; before that the freezing point is reached every night, which